

SECTION 03 52 00
LIGHTWEIGHT CONCRETE ROOF INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

Section specifies insulating concrete placed on a prepared structural deck // and // integral insulating board composite construction //.

1.2 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Description of material.
 - 2. Specifications for mixing, placing, curing and protection of insulating concrete.
 - 3. Interstitial deck: Test specimens reports.
- C. Certificates: Aggregate or foam manufacturer's written certification that applicator has equipment and training to provide a satisfactory installation.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact.
- B. Store in dry and watertight facilities. Do not store materials on ground.

1.4 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Concrete Institute (ACI):
 - 305R-10.....Hot Weather Concreting
 - 306R-10.....Cold Weather Concreting
 - 308R-01 (R2008).....Curing Concrete
 - 523.1R-06.....Guide for Cast-in-Place Low-Density Concrete
- C. American Society for Testing and Materials (ASTM):
 - A82-07.....Steel Wire, Plain, for Concrete Reinforcement
 - A185-07.....Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
 - C150-09.....Portland Cement
 - C260-10.....Air-Entraining Admixtures for Concrete
 - C309-07.....Liquid Membrane Forming Compounds for Curing Concrete

C332-09.....	Lightweight Aggregates for Insulating Concrete
C495-07.....	Compressive Strength of Lightweight Insulating Concrete
C578-10.....	Rigid Cellular Polystyrene Thermal Insulation
C665-06.....	Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
C796-04.....	Foaming Agents For Use in Producing Cellular Concrete Using Preformed Foam
C869-91(R2006).....	Foaming Agents Used in Making Preformed Foam for Cellular Concrete

PART 2 - PRODUCTS

SPEC WRITER NOTE: Update material requirements to agree with the applicable requirements (types, grades, classes) specified in the referenced Applicable Publications.

2.1 MATERIALS

- A. Portland cement: ASTM C150, Type I or Type III.
- B. Lightweight Aggregate: Vermiculite or Perlite conforming to ASTM C332, Group I.
- C. Foaming Agent: ASTM C869.
- D. Air-Entrainment Agent:
 - 1. ASTM C260 type recommended by the aggregate manufacturer.
 - 2. Admixtures with chloride salts or regenerated foam types not acceptable.
- E. Water: Clean and potable, free from impurities detrimental to the concrete.
- F. Insulation and Control Joint Filler:
 - 1. Control Joint Filler: Glass fiber or similar vapor permeable highly compressible material which will compress to one-half its thickness under a load of 172 kPa (25 psi) or less.
 - 2. Insulation: ASTM C665, unfaced for relief vents.
 - 3. Insulation Board:
 - a. Polystyrene: ASTM C578, Type I.
 - b. Board with evenly distributed holes or slots for bonding; approximately 3 percent open area.
- G. Wire Mesh Reinforcing
 - 1. Hexagonal Mesh: Fabricated of ASTM A82, galvanized steel wire 0.9 mm (0.0359-inch) diameter twisted to form 50 mm (2-inch) hexagons with

W0.5 galvanized steel wire woven into mesh spaced 200 mm (18-inches) apart.

2. Welded wire fabric: ASTM A185, 102 x 204 mm (4 by 8-inches) - W1.2/W05 - or 50 x 50 mm (2 by 2-inches) - W05/W0.5.

H. Admixtures:

1. Air Entraining: ASTM C260, Type recommended by the aggregate manufacturer. Admixtures with chloride salts or pregenerated foam types are not acceptable for vermiculite or perlite concrete.
2. Accelerating, Retarding, and Water Reducing: ASTM C494, Type as recommended by insulating concrete manufacturer.

- I. Concrete Sealer: ASTM C309, Type 2, white, pigmented, curing, sealing, hardening and dustproofing concrete, and compatible with latex paint or acrylic paint, not acting as a bond breaker for the paint.

2.2 MIXES AND MIXING

Roof Deck

- A. Mix insulating concrete in accordance with ACI 523.1R or manufacturer's printed specifications where more demanding.
- B. Place in accordance with chapter 5 of ACI 523.1R, or manufacturer's specifications where more demanding.
 1. Cold Weather Concreting: ACI 306R and ACI 523.1R. Remove and replace frozen concrete.
 2. Hot Weather Concreting ACI 305R.
 3. Place insulating concrete to not less than 90 mm (3-1/2 inches) over the top of the steel deck crests.
 4. Smooth the placed material to a uniform finish following the screeding operation.
 5. Free surface of loose material, finish smooth to receive sealer.
- C. Design Mix:
 1. Compressive strength: Minimum 862 kPa (125 psi) when tested in accordance with ASTM C495 except do not oven dry cellular concrete samples.
 2. Dry density: Maximum 450 Kg/cubic meter (28 pcf).
- D. Vermiculite or Perlite aggregate mix.
 1. Mix proportions as recommended by aggregate manufacturer for specified strength and density.
 2. Approximate proportions:
 - a. Ratio of 0.17 cubic meter (6 cubic feet) of aggregate to 42 Kg (94 pounds) of Portland cement.

- b. Air entraining agent approximately 8 Kg (0.11 pound) per 95 L (25 gallons) of water.
 - c. Slump approximately 70 mm (2.7 inches).
 - d. Water to assure uniform and consistent mix.
- E. Cellular concrete mix:
 - 1. Mix proportions as recommended by foam manufacture for specified strength and cast density.
 - 2. Preformed foam concentrate diluted at approximately 40 parts water to one part concentrate.

Interstitial Deck

- A. Compressive Strength:
 - Minimum 1550 kPa (225 psi). Test in accordance with ASTM C495.
- B. Dry density when tested in accordance with ASTM C495.
 - 600Kg/m³ (36 pcf).
 - 450Kg/m³ (28 pcf).
- C. Vermiculite or Perlite aggregate mix.
 - 1. Mix proportions as recommended by aggregate manufacturer for specified strength and density.
 - 2. Approximate proportions: Ratio of 0.12 m³ (4 cubic feet) of aggregate to 42 Kg (94 pounds) of Portland cement with air entraining agent.
- D. Cellular concrete mix:
 - UL design No.P902 for cellular concrete.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Clean deck of debris, oil, and other contaminants that will prevent bond.
- B. Do not start until curbs, sleeves, edge venting, or other penetration forms are completed.

3.2 PLACING INSULATING CONCRETE

- A. Place in accordance with ACI 523.1R or manufacturer's specifications where more demanding.
- B. Cold Weather Concreting: ACI 306R.
 - Remove and replace frozen concrete.
- C. Hot Weather Concreting: ACI 305R.
- D. Place reinforcement as required for fire rating and for seismic areas.
 - 1. Lap the edges of the reinforcement 150 mm (6-inches) and the ends 150 mm (6-inches).
 - 2. Locate at midheight of insulating concrete.
 - 3. Place reinforcement without attachment approximately 13mm (1/2 inch) above steel deck crests in insulating concrete.

- E. Place for thickness and profiles shown.
- F. Place concrete not less than 50 mm (2-inches), or more than 200 mm (8-inches) in thickness.
- G. Slope insulating concrete uniformly, 1 in 50 (1/4-inch per foot) minimum, to drains or scuppers.
- H. Depressions that create ponding are not acceptable.
- I. Leave surface free of loose material and finish to receive roofing material specified.
- J. Roof relief Vents for Vermiculite or Perlite Concrete:
 - 1. Under roof relief vents, remove insulating concrete to structural deck and fill with ASTM C665 insulating material.
 - 2. Coordinate with roofing and sheet metal work to space vents minimum 152 mm (6-inches) in diameter, a maximum distance of 9 m (30 feet) from adjacent vent and from vented edge.
- K. Control Joints For Perlite Concrete:
 - 1. Install minimum 25 mm (1-inch) wide control joint through thickness of perlite concrete around perimeter of roof deck and at junction of roof penetrations.
 - 2. Fill control joints with control joint filler specified.

3.3 PLACING INSULATION BOARD FOR COMPOSITE CONSTRUCTION

- A. Coat concrete roof deck with a slurry of the insulating concrete, minimum 3 mm (1/8-inch) thick.
- B. Fill the corrugations of metal decking with insulating concrete to a minimum depth of 3 mm (1/8-inch) over top of flutes.
- C. Set insulation boards to key into slurry. Install insulation in a stair stepped configuration to form base for slope-to-drain capability.
- D. Place for thickness and profiles shown. Thickness of concrete over insulation board not less than 2 inches.

3.4 CURING, PROTECTION AND TESTING

- A. Roof Deck: Cure in accordance with ACI 308R, or manufacturer's specification where more demanding.
 - B. Interstitial Deck: Cure in accordance with ACI 523.1R or manufacturer's specification where more demanding.
 - C. Interstitial Deck: After curing for not less than 30 days, for vermiculite and perlite concrete, apply on e coat of sealer at approximate rate of 3m²/litre (125 square feet per gallon to insulating concrete in accordance with sealer manufacturer's specification.
 - D. Do not permit traffic on insulating concrete for 72 hours after placing.
- //E. Testing:
- 1. Fasteners pull-out test for roofing: Resist a 14 kg (30 pound) pull-out when driven into cured insulating concrete.

2. Perform roof fastener pull-out test for each 160 square meters (10 squares) or not less than 3 tests whichever is greater.
3. Patch test pull out areas after fastener is removed.
4. Selection of test location and witness of tests by Resident Engineer//.
5. Take a minimum of 4 test specimens at the point of placement for 75 m³ cum (100 cubic yards) of material placed and each days pour.
6. Use 75 mm x 150 mm (3 inch by 6 inch) cylinders for specimens.
7. Test for compressive strength in accordance with ASTM C495 except do not oven dry cellular insulating concrete prior to compressive testing, see ASTM C796, Section 8.9.

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